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patience. On some future occasion it may be my privilege, gentlemen, to lay before you my plan of exploration more in detail. If it could so be brought about that the American Geographical Society should have the facilities placed at its disposal for taking in charge the final settlement of this great geographical question of the North, I as one of its members will be much rejoiced. It is here the interest properly centres. When the purposes of the Society become more widely known and more generally appreciated, as its facilities for obtaining and imparting information upon all questions relating to geography are fully understood by the citizens of New York, the road will be straight before us to what the Society may wish to do. Keeping on as it has done and is especially doing now, in these rooms which we owe to a citizen of rare public spirit (Mr. Peter Cooper), its wants and the public needs will be mutually recognized; and then, in this great mart of wealth and industry, the Society will be always able to command the means necessary to enterprises of the scope and character of that which I have named. Let us hope, at least, that they are not further beyond our reach than they are beyond our aspirations.

II.—*Communication from* Captain SILAS BENT *upon the routes to be pursued by expeditions to the North Pole.*

Communicated September 13, 1868.

2020 OLIVE STREET, ST. LOUIS, MO., *Sept.* 15, 1868.

Charles P. Daly, Esq., President of the American Geographical and Statistical Society:

SIR,—Having seen in the papers a short telegram that "England and Russia were about fitting out an expedition for the North Pole," and having given the subject some reflection in past years—or rather having had the practicability of such an object forced upon my mind by circumstances—I take the liberty of addressing you as the presiding officer of that Society in this country which will naturally take the deepest interest in the plans adopted by the expedition in regard to the route it is to pursue, to state that the result of these reflections is the creation of a strong doubt in my mind as to whether former expeditions to the Arctic Seas have not pursued a mistaken route in attempting to go by the way of Baffin's Bay, instead of by Behring's Straits, or Spitzbergen.

And furthermore, that if Capt. McClure had stood boldly out to the northeast from Behring's Straits, instead of hugging the north shore of the Continent, he would most likely have carried an open sea and a warm current with him till reaching the north of Melville Island, and from thence had a southerly current to the Atlantic Ocean. In other words, whether the expeditions attempting the "Northwest passage" have not gone up stream against a hyperborean current, frigid in its temperature and filled with opposing ice, whilst if they had tried the *Northeast* passage they would have gone down stream, and carried with them the genial warmth of waters directly from the tropics, and I *think* an open pathway far into the Arctic Sea, if not to the very Pole itself.

To enable you to understand the process by which my mind was drawn gradually to this subject, and the conclusions which have been the result, it may not be amiss to enter somewhat into detail. These I shall endeavor to put in such a shape as to be readily followed, and as little tiresome as possible.

Before doing so, however, I will premise by saying, that the duties of a naval officer necessarily oblige him to be more or less observant of the currents of the ocean, as well as of the various other meteorological phenomena by which he is constantly surrounded. Yet it is not always the case that the phenomena presenting themselves within the scope of any one person's experience, lead to either complete results, or furnish even sufficient data upon which to base a reasonable hypothesis. Whether such has been the case in this instance I now with diffidence beg your judgment and indulgent patience to decide.

At the close of the Mexican war in 1848, the United States steamship Preble, to which I was attached as sailing master (or navigator), was ordered from the coast of California on special service, under Commodore James Glynn, to China. In crossing the Pacific we stopped at the Sandwich Islands, where we found a large number of American whalers assembled for the winter. In conversation with one of the most intelligent of these captains, he told me he was just from a cruise in the Arctic Ocean, and that in pursuit of whales "he had gone several hundred miles to the northward and eastward from Behring's Straits, and *three hundred miles beyond the limit of his charts, and with an open sea still before him as far as could be seen in that direction.*"

From the Sandwich Islands we kept between the tropics, so as to avail ourselves of the Northeast Trade winds, and also of the great Equatorial Current, which we found setting to the west at the rate of from thirty to eighty miles per day. This current, uniform and constant in its direction and velocity, and spreading from the Tropic of Cancer to Capricorn, has a width equal to that of the whole Atlantic Ocean. A few months after our arrival in China intelligence was received from the Governor-General of Java, that a number of shipwrecked American seamen were in prison at Nagasaki, in Japan, and the Preble was ordered to proceed thence at once, and endeavor to obtain their release. This was in midwinter, when the Northeast Monsoon was at its height, and when no vessels but steamers or opium clippers attempted to make passages to the north coast of China, and it was almost universally predicted by both Americans and English that our ship would never accomplish the voyage at that season of the year. But with true pluck the captain replied that "she should do it or else leave her bones in the bottom of the China Sea." I mention this to show how comparatively unknown were the dangers, and how unfrequented were the seas at that time, which lay in our way between Hong Hong and Nagasaki. As soon as we got out of port we encountered not only the full force of the monsoon, but also, in a manner, that of the southerly current, which constantly flows down the Formosa Channel, and with such strength that sailing vessels can never contend against it when—as at this season of the year—the wind blows in the same direction with the current, but are obliged to run out to the eastward of Formosa, where a current is always found setting to the northward, or in a diametrically opposite direction to that of the current first spoken of. The Preble struggled some ten or twelve days before reaching the south end of Formosa, although the distance is only about two hundred and fifty miles, having found the current down the Formosa Channel running to the southward at the rate of six miles per hour. She had hardly attained this point before the wind freshened into a stiff gale from northeast, compelling us to heave the ship to under storm sails, and preventing our getting any observations for latitude or longitude for three consecutive days. The effect of the wind upon a ship thus lying to—if uninfluenced by ocean currents—would be to drift her to leeward, or in the direction that the wind is blowing, at the rate of about thirty miles a day. At the expiration of the three days, therefore, when the storm abated and land was discovered to the westward, we thought it must be the Bashee Islands, which lie some hundred miles to the southward of

Formosa; but upon standing in we found it to be the northern end of the latter island, and that we had been carried by a current ninety miles to the northward against the wind, or one hundred and eighty miles to the northward of where the ship would have been had there been no current, and near five hundred miles to the northward of where she would have been had she continued within the influence of the southerly current of the Formosa Channel! After determining our position upon the chart, we stood to the eastward for the Loo Choo Islands, running across and out of the northerly current. From Loo Choo our course was nearly due north to Nagasaki. In making this passage we found that we again crossed the current (but it there had a northeasterly direction), running out of its western limit of passing under the land of the Japanese Islands. After accomplishing the object of our mission to Nagasaki, we ran to the westward to Shanghae, and thence down the Formosa Channel to Hong Kong, carrying with us the strong southerly current before spoken of, although by this time the Northeast Monsoon had materially abated.

In the following summer the Preble was ordered back to California. The monsoons had then changed, and the wind was from the southwest; yet we found the current still setting down the Formosa Channel, and on doubling the south end of the island we again fell at once into the stream setting to the northward, and which we found curved gradually to the eastward with us as we pursued our course on the arc of a great circle in that direction. This course, however, we were obliged to abandon about latitude 35° N., 145° E., owing to a malignant epidemic that had broken out in the ship, and which was aggravated by the fogs and mists that overhung the current.

The experience of this cruise thus confirmed the existence of two powerful currents which, in a general way, were well known to vessels trading or cruising in those seas, and which had been briefly noticed by writers upon the subject. But in what way, if at all, they formed a part of the great oceanic or inter-oceanic circulation was *not* known, and formed a bewildering subject to those who had to encounter them; particularly as the charts were so inaccurate, that they were as likely to lead a vessel into danger as guard her from them; and also as it was known that a few miles to the southward of the south end of Formosa, the great Equatorial Current poured its immense volume into the China Sea *almost directly at right angles to both of these currents.* This illustration of their great velocity—their constant flow in fixed and opposite directions regardless of winds or seasons, and their juxtaposition—was well calculated to make a strong impression upon the mind, and set it to work to find out their origin, causes, and whither they led.

Sailing again for China and Japan in 1852, in Commodore Perry's Expedition, I had fortunately assigned to me for investigation during the cruise, such subjects of a scientific and professional character as enabled me to have instructions issued to the various vessels of the squadron, that insured a very thorough and careful meteorological record being kept during our operations in those seas; and after our return to the United States, I was detailed to assist Lieutenant M. F. Maury to prepare the charts, sailing directions, etc., for publication, and these meteorological records were placed in my hands for special examination in reference to the currents in that part of the Pacific Ocean and adjacent seas lying within the cruising grounds of the expedition.

The result of this investigation was the discovery of the fact that these currents formed a part of a great system in the Pacific, identical in all its essential features with that of the Atlantic, embracing the Equatorial Current, the Gulf Stream and its counter current along the eastern shores of the United States, as will be seen on referring to my report on the "Kuro-Siwo," or Japan Stream, published in the second volume of the Japan Expedition Report. The development of these facts, as the data were traced on the chart, created no small degree of surprise and gratification, and naturally led to further reflection and inquiry as to where these *counter* currents, to both the Gulf Stream and Kuro-Siwo, had their origin, and how far their compensating influence contributed to keep up the equilibrium of the waters of the two oceans.

In doing this, the first consideration was, that here were the two grand currents of the world; one in the Atlantic and the other in the Pacific, moving to the westward along the equator. That of the Atlantic finding no other outlet from the Gulf of Mexico, has its whole volume forced round to the north of Cuba, and deflected thence northwardly along the coast of Florida, forming the Gulf Stream—whilst that of the Pacific, passing mostly through the Polynesian Islands and China Sea, has a *large shaving,* as it were, torn off its northern side by the south end of Formosa, which by its condensed momentum is, like the Gulf Stream, thrown with increased velocity to the northward and forming the Kuro-Siwo or Japan Stream. These streams obeying certain physical laws, bend gradually to the eastward as they advance on their northward course, until meeting with local obstructions the larger portion of each is turned to the southward—the one along the west coast of Europe, and the other along the west coast of America, ameliorating the climates of those sides of both the continents by their genial warmth, and finally falling again into the equatorial currents of their respective oceans. Portions of both of these streams, however, pursue their courses uninterruptedly to the northward and eastward into the Arctic Ocean—that from the Gulf Stream by the way of Spitzbergen, and that from the Kuro-Siwo by Behring's Straits. The accumulation of water about the Pole from these two offshoots must, of course, find an outlet somewhere, and it is in this that we find the origin of the counter currents of both the Gulf Stream and the Kuro-Siwo, as also that of the hyperborean current which flows to the southward along the east coast of Greenland, bearing within its embrace the largest of the icebergs seen by vessels plying between Europe and the United States, and far into the warm waters of the Gulf Stream, which it underruns as the latter crosses the Atlantic. The counter current of the Gulf Stream starting from the Arctic Ocean finds its outlet through the channels and passages leading into Baffin's Bay and Davis Straits, thence down the Labrador Coast to Newfoundland, and wedges itself in between the western side of the Gulf Stream and the shores of the United States. The counter current of the Kuro-Siwo finding but a narrow outlet at Behring's Straits, underruns the warm water flowing to the northward through these straits, and makes its appearance at the surface again on the coast of Kamschatka, and flows thence down through the Japan Sea, between the Japan Islands and the main coast of Asia, and through the Formosa Channel into the China Sea. An open sea along the Spitzbergen branch of the Gulf Stream has been explored far to the northward of the White Sea, but not to its uttermost limits, by either navigators or fishermen—whilst the current flowing to the northeast through Behring's Straits is known to our whalers, as shown by the statement of the captain of one of them, whom I have mentioned as having met at the Sandwich Islands, and which has been subsequently corroborated by the explorations of Captain John Rodgers, who in command of the United States North Pacific Exploring Expedition, penetrated to the northward of Behring's Straits in 1854 and '55, in search of Herald Island, reported by a British officer as lying to the northwest of those straits.

The island was not found, but an icy barrier was encountered in that direction (northwest), but as soon as he ran off to the northeast, he informed me he had *an open sea, with a current flowing to the northward and eastward, and with a temperature of the water much above that due to the latitude!* Now, when we examine the effects of these currents of water upon the climates of the regions of the earth over and near which they pass, it is very remarkable to what a degree they are modified and changed. For instance, the mild climate of Western Europe is owing entirely to the softening warmth carried thence from the tropics by the Gulf Stream, whilst the eastern coast of the United States owes much of its rigor to the hyperborean current which intervenes between it and the Gulf Stream; and we have Lisbon, in the latitude of Philadelphia, with the genial climate of Pensacola, and London, in latitude 52° north, with the climate of Norfolk; whilst the same phenomena of thermal difference is found equally marked between the two shores of the North Pacific, and attributable to precisely similar causes.

There is, however, a remarkably conservative feature in these currents, which owing to the non-conductive character of water and air, enables them to carry their warmth to such immense distances. So long as they are troughed or imbedded in the oceans, there is but little radiation of their heat; as will be seen by the thermometric scales on the diagrams accompanying the report on the Kuro-Siwo, where the changes of temperature of both the air and water is sudden and coincident with each other. And then, too, this is very noticeable on the east coasts of the United States and Asia, where the narrow, cold streams coming from the north, give climatic character to the land whose shores they wash; to the entire exclusion of any influence from the warm streams just outside of them. But as soon as these warm streams (the Gulf Stream and Kuro-Siwo) touch the opposite shores of their respective oceans, the land robs them of their heat, and so conducts and diffuses it far into the interior, that the temperature of nearly one-half of both continents is affected by it.

It does not seem, therefore, unreasonable to believe that the remaining portions of the Gulf Stream and Kuro-Siwo—possessing the same heat-conserving powers—that penetrate the Arctic Ocean, carry with them warmth enough not only to dissolve all the ice and snow they encounter in their paths, but enough also to keep an open sea about the Pole at all seasons of the year, and thus prevent this extremity of the earth becoming locked up in eternal ice, and overburdened in the lapse of ages with the accumulations of snow precipitated from the moisture of winds loaded with evaporations, and carried thence from more southern and warmer regions of the earth's surface. It was probably the southern edge of this open sea, with its temperature of +36° in latitude 81° north, that was seen by Dr. Kane's Expedition. The Doctor called at my office in New York, after his return in 1856, just as I had finished my work on the Kuro-Siwo; when I suggested to him that this open sea discovered by him, most likely owed its existence to the influences just named. He seemed impressed by the facts presented to him, and in his Narrative, vol. I., p. 309, when discussing the causes of this open water, he not only admits the possibility of such being the case, but evidently thinks it altogether likely.

I learn (from a newspaper telegram) that a private yacht sailed during the past summer for the North Pole, by the way of Spitzbergen. She is on the right track, and if she is a steamer and follows the water thermometer rather than the compass, I believe she will accomplish her object, and her return may be looked for any day this or next month.

In conclusion, I have merely to say, if my theory proves unworthy the consideration of your learned association, why then the matter most probably ends; but if it is correct, then I hope my humble suggestions may, in Heaven's Providence, be the means of averting the occurrence of some of the sad calamities that have attended former expeditions, and perhaps facilitate the solution of this great geographical problem that has so long occupied the attention of men of science.

With renewed assurances of the unaffected diffidence with which I have ventured to write you upon this subject,

I am, very respectfully,
Your ob't serv't,
SILAS BENT.

2020 OLIVE STREET, ST. LOUIS, *Oct.* 12, 1868.

CHARLES P. DALY, Esq., *President American Geographical and Statistical Society, New York:*

DEAR SIR,—Your kind favor of the 8th instant is received, and I pray you to accept my cordial acknowledgments for your courteous attention. I am much gratified to learn that my communication has been found by you worthy of being submitted to your Society. I shall watch with interest for accounts of the causes of failure in the recent attempt of the yacht to reach the Pole by the way of Spitzbergen; though I expect to hear that—like Captain Parry and other explorers—she endeavored to steer *directly north*, after getting to the eastward of Spitzbergen, instead of keeping on to the northward and eastward along the path of the Gulf Stream until getting fully into the open sea.

This was the mistake made by Parry in 1827, who crossed the warm current of the Gulf Stream setting strongly to the northeast, before reaching Spitzbergen, and after getting to the northward of those islands he fought persistently against the southeastwardly set of the hyperborean current which he then fell in with, and which—if followed—would have carried him back into the Gulf Stream, and perhaps given him a much better chance of accomplishing his object with his ship, than he found in his sledge-boats. For on his return to the ship, after his failure with boats and sledges, he found to his surprise the sea all open to the northeast, and apparently affording, in his opinion—as expressed in his narrative—access for his ship to as high a latitude as he had reached in his laborious journey over the ice.

In my former communication, my hypothesis, that the Gulf Stream and Kuro-Siwo keep pathways open at all seasons to the Pole, should, perhaps, be qualified with an exception as to the early summer, when icebergs and field ice are both doubtless driven by the winds and counter currents well into—if not across—these streams, as they are into the Gulf Stream in the North Atlantic, and interrupting in this way a free passage for the time being; but which never form a permanent or solid ice barrier across these streams.

On that account, it may be, that the summer is not the best season for making the attempt to reach the open sea, but that the early spring, before the ice is detached from its winter fastenings, is the time best calculated for success. That there is an open sea, with a temperature permanently above the freezing point, surrounding the North Pole (and the South Pole too for that matter), I have no doubt. If this is the case, to reach the Pole then, it must be done in ships; *and the only avenues by which they can enter this Polar Sea is by following the Gulf Stream or Kuro-Siwo in their northeastwardly courses to that sea.* These afford the only accessible channels or gateways through the ice surrounding this sea; and to find and to follow these, the water thermometer is the only guide. Nor must the surface temperature be wholly relied upon, for Captain Rodgers—whom I have before spoken of—mentioned to me the remarkable fact, that northeast of Behring's Straits he found the water lying in layers of different temperatures. First a cool, then a warm, and beneath that a cold stratum of water! For a time I was at a loss to account for this, but upon subsequent reflection it occurred to me that this was a natural arrangement of waters of different specific gravities. That of the lowest temperature being the densest, clings to the bottom—the warmest water, from the salt it contains, being next in weight overlies the first, and then the cool fresh water formed by the dissolution of the ice, floats on the surface and is carried with, and becomes a part of the current immediately underlying it. This arrangement seems, too, to be a wise provision of Nature, by which the warm current is insulated, as it were, to prevent too great a loss of its temperature whilst passing the region of ice, but which, after reaching the open sea, and having by that time warmed the water above, it spreads out, whilst at rest for a time about the Pole, and throws off by the atmosphere much of its warmth before starting on its return course to the south again.

So it will be seen that a sub-surface temperature by the use of Six's thermometer, should be taken, as well as the surface temperature, whenever the latter is not above that of the atmosphere.

With renewed thanks for your goodness,

I am, very respectfully,
Your ob't serv't,
Silas Bent.

III.—*The Northmen in America.* By the Rev. B. F. De Costa.

Read December 17, 1868.

The first voyage to America of which we have any account was performed by the Northmen. But who were the Northmen?

The Northmen were the descendants of a race that in early times left Asia, travelled towards the north, and settled in the present territory of Denmark. From thence they overran Sweden and Norway, afterwards colonizing Iceland and Greenland. Their language was the old Danish (*Dönsk tunga*), once spoken all over the north, but now preserved in Iceland alone.

The first of these settlers reached Iceland in the year 875, when the Irish monks, who were there before, at once fled.